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Research Report

The impact of Covid-19 on global value chains

BOFIT Policy Brief, No. 2/2021

Provided in Cooperation with:

Bank of Finland, Helsinki

Suggested Citation: Simola, Heli (2021) : The impact of Covid-19 on global value chains, BOFIT Policy Brief, No. 2/2021, Bank of Finland, Bank of Finland Institute for Emerging Economies (BOFIT), Helsinki,
<https://nbn-resolving.de/urn:nbn:fi:bof-202101141046>

This Version is available at:

<https://hdl.handle.net/10419/251703>

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BOFIT Policy Brief
2021 No. 2

Heli Simola

The impact of Covid-19 on global
value chains



Bank of Finland, BOFIT
Bank of Finland Institute for Emerging
Economies

BOFIT Policy Brief
Editor-in-Chief Mikko Mäkinen

BOFIT Policy Brief 2/2021
14.01.2021

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ISSN 2342-205X (online)

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Heli Simola

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Abstract

The Covid-19 pandemic has hit international trade hard, creating concerns of serious disruptions to global value chains (GVCs). This paper provides a preliminary analysis on the development of GVC trade during the current crisis with a focus on the internal and external trade of the EU. The potential consequences of the pandemic and other key factors for GVCs are discussed on the basis of a review of recent literature. We find that trade overall has been hit hard by the pandemic, but not GVC trade in particular. The sector of transport equipment makes a notable exception. Our analysis suggests that the Covid-19 crisis will not necessarily lead to a major restructuring of GVCs, but could fortify several trends shaping GVC development. While several factors limit future expansion of GVCs, the requisite complexity and high restructuring costs of existing GVCs make it unlikely that they will be dismantled anytime soon.

Keywords: Global value chains, International trade, Covid-19

Acknowledgements: I thank Iikka Korhonen and Mikko Mäkinen for their helpful comments.

1. Introduction

The Covid-19 pandemic hit international trade hard, causing observers to worry that lockdowns and other restrictive measures might cause serious disruptions of global value chains (GVCs) by accelerating and amplifying propagation of economic shocks across countries, and ultimately deepening the global economic crisis. Beside a similar collapse in GVC trade as seen during the 2008 global financial crisis (GFC), serious disruptions of GVCs this time around have forced companies to re-evaluate their production structures and supplier networks to improve risk management. This concern could trigger further adjustments in global production networks.

In this paper, we analyze the development of GVC trade during the current pandemic and discuss it in light of GVC trends over recent decades. We also evaluate the consequences of the Covid-19 pandemic for GVCs on the basis of a review of recent literature. Section 2 provides a background on GVCs and their role in the global economy. Section 3 presents some major long-term trends for GVC development. Section 4 discusses the outlook of GVCs based on the analysis. The final section summarizes.

2. What is a GVC?

The term “value chain” applies to the whole production process of a good or service from design and raw material processing to manufacturing and marketing services for the final customer. A “global” value chain features production dispersed across multiple countries. Despite wide use of the term, however, there is no settled definition for GVC. Li et al. (2019) categorize production of goods and services into production for domestic use, production for conventional trade and production for GVC trade. Conventional trade involves trade in final goods entirely produced domestically that are exported for final consumption. All other trade is considered GVC trade.

Under the broad definition, GVCs include any production that combines inputs originating from two or more countries (Antras, 2019; Li et al., 2019; Wang et al., 2017). The most obvious case refers to trade in raw materials and intermediate products, i.e. *simple GVC trade*. Under a somewhat narrower definition, the concept is limited to *complex GVC trade*, i.e. production that requires two or more border crossings. For example, complex GVC assessment only looks at imports used in production of export products, not products imported for domestic consumption (Wang et al., 2017).

Apart from multiple border-crossings, GVC trade (particularly complex GVC trade) is distinguished from conventional trade by a deep level of specialization needed to achieve high productivity. Complex GVCs are also typically based on fixed long-term relationships between buyers and suppliers, a feature that does not necessarily hold for conventional trade. GVC trade is often associated with asset-specific transactions or intra-firm trade within multinational enterprises (MNEs) that may be difficult to substitute or replace (Antras, 2019; UNCTAD, 2020; World Bank, 2020).

2.1 Data and measurement of GVCs

Measuring GVCs is difficult due to the vagueness of the concept and lack of appropriate data. GVC analysis can be based on international *input-output data* that allow calculating trade flows in value-added terms, or may rely on ordinary *trade statistics*, particularly in firm-level set-ups.¹ While both

¹ A recent report by OECD and Statistics Finland (2020) provides the interesting novelty of granular value-added trade data for Finland.

approaches have their advantages and disadvantages, they generally give a similar picture on the overall development and characteristics of GVCs. In fact, these approaches can complement each other by providing information on GVCs from different perspectives.

2.1.1 Analysis based on input-output data

With improving data availability, the use of international input-output data has increased in recent years. Input-output data depicts global production networks and allows slicing the value added embodied in production chains by country and sector. This approach not only avoids double-counting in situations where goods and services cross borders several times during the production process, but readily accounts for trade in services. International input-output data are typically available only on a relatively aggregate sector level, thus requiring the imposition of strong assumptions in building the dataset. In addition, the data tend to have a limited coverage over time and countries, as well as publication lags of several years (Antras, 2019; Johnson, 2018; Timmer, et al. 2015).

The general picture on GVC development is quite similar, independent of the dataset or measure used. Due to differences in underlying assumptions in building the datasets, there is a degree of variation across data sources.² Popular indicators depicting GVC participation on the basis of international input-output data include backward and forward GVC participation indices, upstreamness indices and GVC length indicators. These are calculated either on an aggregate country basis or for particular industries.

The most commonly used indicators in the analysis of GVCs are backward and forward participation indices. A *backward GVC participation index* describes the share of imported value added in a country's exports. A *forward GVC participation index* is the share of value added exports used as an input for exports of other countries (Antras, 2019; ECB, 2019; Johnson, 2018). By definition, both types of indices apply to complex GVCs. Countries with higher participation index values are more intensively involved in GVCs than countries with lower values.

GVC development has also been examined with a measure of *GVC length*, i.e. the average number of production stages between primary inputs and final products (Antras et al., 2012; Degain et al., 2017; Miroudot & Nordström, 2020; Wang et al., 2017). Longer GVCs tend to have a snake-like structure with value created sequentially in a series of stages. Shorter GVCs can be arranged in a spider-like hub-and-spoke structure, whereby inputs from various sources are combined at an assembly plant (Baldwin & Venables, 2013). Many GVCs have gradually evolved into highly complex networks structures covering thousands of suppliers (Amador & Cabral, 2017; McKinsey, 2020).

Upstreamness (or *downstreamness*) refers to the position of a country within the GVC. Upstream countries are involved with the early production stages of the production chain, while downstream countries perform the production stages near the end of production chain and close to final consumers. Chain position has important implications as to how much value added a country captures from the value chain, although the relationship is not straightforward, i.e. an upward position does not necessarily confer higher value added or more income (Antras et al., 2012; Baldwin, 2012; Ignatenko et al., 2019). Indeed, the distribution of value added in production chains is often depicted as a "smile curve." Production stages providing highest value added are located at either the beginning (e.g. design function) or at the end (e.g. marketing services). The manufacturing stage, which usually lies around the middle of the chain, is typically associated with the smallest share of value added (Baldwin, 2012; De Backer & Miroudot, 2013; Meng et al., 2020).

² There are several international input-output databases currently available, including EORA, IDE-JETRO, OECD TiVA and WIOD (Antras, 2019; Johnson, 2018; Timmer et al., 2015). All are based on similar methodologies, but differ in certain underlying assumptions, details and coverage.

2.1.2 Analysis based on trade statistics

The main drawback to using ordinary trade statistics in analyzing GVCs is that the actual value added cannot be teased out from the data.³ The value of intermediates is often recorded multiple times in trade statistics when a good is shipped several times across borders. Thus, GVC analysis based on ordinary trade statistics must typically be conducted at a very disaggregate level to alleviate this problem. The advantages of ordinary trade statistics, however, are that they have a wide coverage by time and country, they are publicly available at a highly detailed product level and published with only short lags. Moreover, ordinary trade statistics allow firm-level examination (and after all, it is firms that construct GVCs, not countries or sectors).

Ordinary trade statistics can be used in macro-level GVC analysis to complement the picture from input-output data. A commonly used proxy for GVC participation is the share of intermediate goods or parts and components in total goods trade. The share of intermediate goods in imports has been shown to correlate relatively well with the backward participation index calculated from input-output data (Antras, 2019; ECB, 2016, Haugh et al., 2016). Separating out semi-finished products from parts and components allows for more detailed examination of GVC development (Athukorala, 2011; Gaulier et al., 2020; Yeats, 1998).

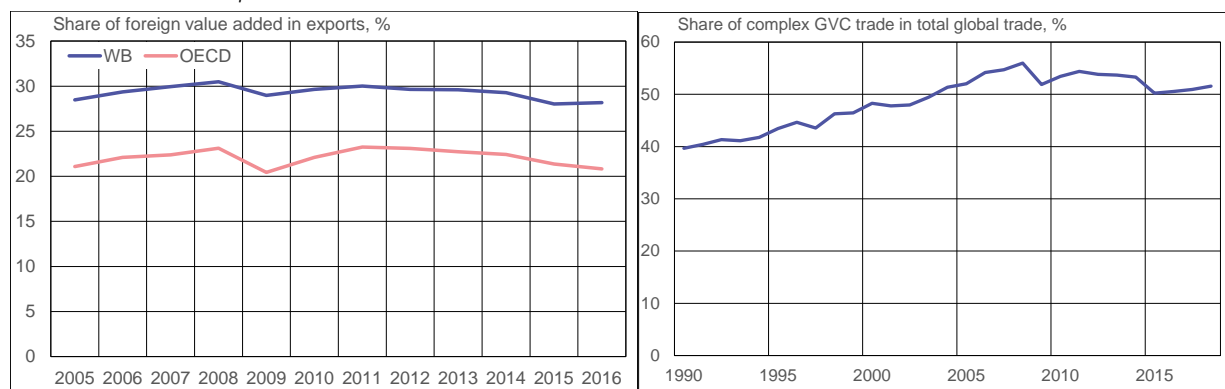
2.2 Development and drivers of GVCs

Like trade generally, efficiency gained through specialization drives GVCs. Specialization can be driven by comparative advantage (e.g. offshoring labor intensive manufacturing or certain services from high-wage countries to low-wage countries) or economies of scale and cluster advantages (e.g. horizontal value chains between high-wage countries). The costs of dispersion of production is the main factor impeding GVC development (e.g. transport costs and coordination costs). When a firm designs its value chains, the gains from specialization must more than offset the costs of dispersion (Baldwin, 2012; Baldwin & Robert-Nicoud, 2014; Grossman & Rossi-Hansberg, 2008; World Bank, 2020).

The general trends in GVC development are similar with all indicators, but there is variation in the level estimates depending on the data source and measure used (Fig. 1a). The current share of GVC trade in total global trade is estimated to have increased by 10 to 15 percentage points from the 1970s (Johnson & Noguera, 2017; Pahl & Timmer, 2018; World Bank, 2020). The biggest rise was seen in the 1990s and early 2000s (Fig. 1b). Despite greater international dispersion of production, the vast majority of global production still falls into the domestic use category. The share of traded production is currently about 20–30%, with about two-thirds of that accounted for by GVC trade. Most studies estimate that the present share of complex GVC trade is around half of total global trade (ECB, 2016; Gaulier et al., 2020; Li et al., 2019; World Bank, 2020). GVC trade is often associated with MNEs. The share of MNEs in global exports is also put at about half (Cadestin et al., 2018).

³ This is not a flaw of the ordinary trade statistics as such, but rather a reflection of the purpose for which the figures were originally recorded.

Figure 1. a) Share of foreign value added in exports in 2005–2016. b) Share of complex GVC trade in total global trade in 1990–2018, %.



Sources: OECD TiVA, World Bank EORA.

The key trend of the past decades is the rise in complex GVC trade, as simple GVC trade is no new phenomenon. Raw materials have flown around the globe already for centuries and simple GVC trade increased substantially already at the end of the 19th century supported by improved transport possibilities (Baldwin 2012). The increase in GVC trade was an important driver of the rapid growth of overall international trade in the 1990s and in the first years of the 2000s. During that time, trade growth far exceeded GDP growth, implying a notable increase in the income elasticity of trade and trade intensity of global GDP (Constantinescu et al., 2020; ECB, 2016; Haugh et al., 2016).

The main drivers of GVC expansion were technological development, global liberalization of trade and investment policies and a huge increase in the global labor supply. Technological development enabled deep specialization and geographically dispersed production through lower transport and coordination costs. Technological advances also facilitated trade in services. Worldwide liberalization of trade and investment policies lowered trade costs further and facilitated expansion of MNEs. The opening up of communist economies in the 1990s – and China in particular – led to a huge increase in the availability of low-wage labor that provided possibilities for cost savings in labor-intensive production (Antras, 2020; Baldwin, 2012).

The 2008 GFC precipitated an unprecedented collapse in global trade. The main cause of this collapse was the demand shock, with financial factors and increased protectionism playing smaller roles (Baldwin, 2009; Bems et al., 2011; Bussiere et al., 2013). Global trade declined much more than global GDP.

The trade decline was fortified by the synchronized timing of the crisis and the nature of the demand shock, i.e. a compositional effect. The major demand cut focused on “postponable” goods (and to lesser extent services) that make up a large part of world trade but only a small part of global GDP. Since GVCs are prevalent especially in the production of these goods, contraction of GVC trade was particularly sharp (Bems et al., 2011; Eaton et al., 2016; Escaith et al., 2010; Levchenko et al., 2010). In addition, there is evidence of a strong inventory adjustment effect, or *bullwhip effect*, associated with GVC trade (Alessandria et al., 2011; Altomonte et al., 2012; Závaczka, 2012).

International trade recovered quite rapidly from the depths of crisis. This recovery was apparently supported by the fact that the trade collapse mainly focused on the *internal margin*, as opposed to the *external margin*. Trade volumes and unit prices contracted strongly, while the number of firms, products and markets involved in trade did not decline much. The preservation of trade relationships helped to quickly restore trade flows in the aftermath of the crisis (Behrens et al., 2014; Bricogne et al., 2012; Hadad et al., 2010).

Since 2012, however, global trade development has been sluggish. Trade elasticity has declined notably and global trade intensity stalled. There is no consensus in the literature whether the main

contributing factors are cyclical or structural, but several factors seem to have played a role (ECB, 2016; Haugh et al., 2016; Ollivaud & Schwelnuess, 2015; Timmer et al., 2016). Demand has shifted both geographically and sectorally to less import-intensive countries (especially China, but also other major emerging economies like India) and industries (especially service sectors). In addition, protectionist pressures have increased in many countries. GVC development has also been found an important factor slowing the growth of global trade (Constantinescu et al., 2020; ECB, 2016; Haugh et al., 2016; Timmer et al., 2016).

In recent years, GVC expansion seems to have stalled at both the aggregate level and across countries (ECB, 2016; Timmer et al., 2016; World Bank, 2020). In addition, GVC length (especially the international parts) has shortened after recovering in 2011–2012 (Li et al., 2019; Miroudot & Nordström, 2020). Several factors have affected the sluggish development of GVCs in recent years. The motivation of labor cost minimization has faded as the share of labor costs has declined in many sectors due to increased automation and as the wage differential between advanced and emerging economies has narrowed (especially wage differences with China). Protectionist pressures have increased across the globe discouraging GVC expansion. The Chinese economy today is more oriented towards domestic production reducing China's participation in GVCs (ECB, 2019; Miroudot 2020c; Timmer et al., 2016; Simola, 2018). Very recently, however, there have been indications that GVC growth may be picking up again (Gaulier et al., 2020; Li et al., 2019).

2.3 Characteristics of GVCs

While the trend of GVC expansion in past decades is common to the majority of economies, there is considerable variation concerning participation in GVCs across regions and countries (Fig. 2a). The main GVC regions are Europe, North America and East Asia, organized around hub countries of the US, Germany, Japan and more recently China. The role of regions such as Latin America and Africa in GVCs is notably smaller (Baldwin, 2012; Rodrik, 2018; World Bank, 2020). According to OECD data for 2015–2016,⁴ for example, backward participation at country level varied from 5% in Saudi Arabia to 68% in Luxembourg. For forward participation, the figures were quite the opposite: 11% for Luxembourg and 37% for Saudi Arabia.

Variables like market size and geographical distance, which are important in determining trade flows in empirical gravity models, also affect the likelihood of GVC participation. Factors increasing trade costs like distance and tariffs tend to affect GVC trade even more than conventional trade due to the higher number of border crossings. The determinants of backward and forward participation vary to some extent. Large countries tend to have lower backward participation rates (less imported inputs) and higher forward participation rates (more exported inputs) due to wider domestic supplier possibilities. Central geographic location and proximity to GVC hubs especially supports backward participation, while more peripheral countries tend to specialize in more upstream activities and have higher forward participation. Larger natural endowments increase forward participation, but results regarding labor endowments or labor costs are somewhat mixed.⁵ More liberal trade and investment policies, as well as higher institutional quality, support backward participation, especially in the case of complex GVCs (Antras & de Gortari, 2020; Ignatenko et al., 2019; Johnson & Noguera, 2012; Kowalski et al., 2015; World Bank, 2020; WTO, 2017).

⁴ These figures are the latest available from the OECD TiVA database: <https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm>.

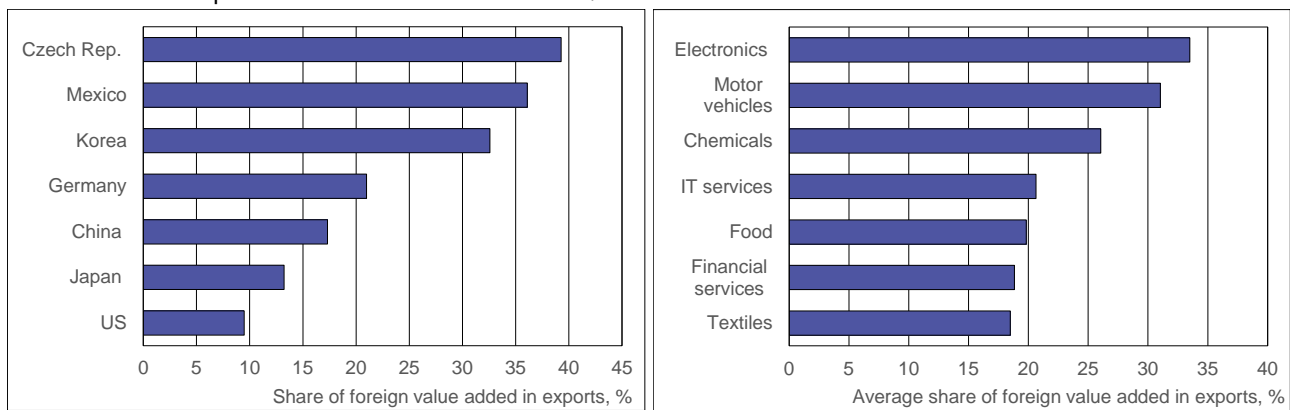
⁵ This can reflect data availability and heterogeneity of GVCs. The data are provided on a sector, rather than task, level, which can blur the picture of labor intensity. Moreover, taking advantage of labor cost differentials is not the sole motive for GVC dispersion.

From a geographic standpoint, East Asian and European GVCs tend to be regional. In North America and elsewhere, GVCs are mainly global in the sense that main contribution of foreign value added originates outside the respective region (Li et al., 2019; World Bank, 2020). East Asian GVCs have become more regional in recent years, while GVCs in all other blocs have become more global (Li et al., 2019; Los et al., 2015; Miroudot & Nordström, 2020; Simola, 2017). This largely reflects the substantial increase in the role of China in regional and global production networks.

GVC development varies greatly across sectors (Fig. 2b). In primary production and low-technology manufacturing and services GVC participation is typically lower and GVCs are less complex. GVCs are not sliced in tasks but are more associated with traditional trade in raw material inputs and/or final products. Especially forward participation in GVCs (supply of inputs) is based on abundance of raw materials or vast unskilled labor resources in labor intensive sectors like textile production. Commercial relations are more often based on arms-length transactions than intra-firm trade (Baldwin, 2012; Simola, 2017; UNCTAD, 2020; Wang et al., 2017).

While intensive, complex GVC participation is most typically found in high-technology manufacturing, it has increasingly concerned services in recent years as the importance of services has increased both in final demand and as an input in manufacturing production (servicification of manufacturing) in line with the smile curve (Baldwin, 2012; Simola, 2017). Production is divided at task level. Countries with abundant unskilled labor can perform labor-intensive production such as assembly, while countries with abundant skilled labor take care of e.g. design and engineering of products (Timmer et al., 2019). Geographical proximity is more important for production of heavy products such as transport equipment, whereas value chains associated with lighter products such as electronics can be dispersed widely across countries. Liberal trade and investment policies, as well as institutional quality, are important factors for participating in these GVCs due to their complexity. These GVCs are also often based on more fixed relationships between buyers and suppliers (UNCTAD, 2020; World Bank, 2020).⁶

Figure 2. a) Share of foreign value added in exports of selected countries in 2015, %. b) Average share of foreign value added in exports in selected sectors in 2015,%.⁷



Source: OECD TiVA.

⁶ More detailed classifications of GVCs by sector and country are provided in McKinsey (2019), UNCTAD (2020), World Bank (2020).

⁷ Average, weighted by gross export shares, across 64 economies included in the OECD TiVA database.

2.4 Economic effects of GVCs

The expansion of GVCs has supported global economic growth through improved efficiency in firm production. Deeper specialization associated with complex GVCs has been shown to enhance productivity similarly to a technological change (Baldwin & Robert-Nicoud, 2014; Grossman & Rossi-Hansberg, 2008). There is also empirical evidence that higher GVC participation is associated with higher income levels both at country level and for individual workers. This is especially the case for backward participation, which appears to support high production growth of firms. There is, however, heterogeneity in the magnitude of the estimated effects (Constantinescu et al., 2019; Kowalski et al., 2015; Pahl & Timmer, 2019; Wang et al., 2017; World Bank, 2020).

Companies participating in GVCs benefit from higher efficiency and cost savings, while consumers enjoy wider variety and more affordable products and services. There is also plenty of evidence that GVC participation is associated with higher firm-level productivity (Amiti & Konings, 2007; Goldberg et al., 2010; Halpern et al., 2015). The literature suggests that efficiency gains from participation in GVCs leading to increased production creates new jobs and supports higher wages (Bacchetta & Stolzenburg, 2019; ECB, 2019; Farole et al., 2018; Lu et al., 2019; Shepherd & Stone, 2013).

Finer division of production stages associated with GVCs has enabled several emerging economies to enter global markets through narrow specializations that obviate the need to master an entire production process. This has created millions of new jobs with higher wages and substantially reduced poverty in many emerging economies. For certain countries (again, with China the most prominent example), GVC participation also supports qualitative development, or *climbing up the value ladder*. Starting from low value-added production stages such countries gradually move up the value chain by shifting to higher value-added production. This rise is often supported by the technology transfers associated with complex GVCs (Antras, 2019; Baldwin, 2012; Ignatenko et al., 2019; Kowalski et al., 2015; World Bank, 2020).

Notwithstanding aggregate-level gains for the global economy, the downside of GVC expansion is that the gains are not evenly distributed across countries, firms or people. The literature suggests that the benefits of GVC expansion have accrued disproportionately to capital and high-skilled labor, certain large countries (with China the most prominent example), as well as large multinational corporations. In contrast, low-skilled workers in many countries and certain less-developed regions have fallen behind due to the rapid rise of GVCs. As a result, discontent over GVC activities has risen in developed and emerging economies (Antras, 2019; Baldwin, 2012; Rodrik, 2018; Timmer et al., 2014; World Bank, 2020).

In recent decades, the income share of capital in GDP has increased globally, while the income share of labor has declined. The literature suggests that this is mainly due to increased automation, but there is also evidence that the expansion of GVCs has played a role (Karabournis & Neiman, 2013; Reshef & Santoni, 2019; Timmer et al., 2014). In the presence of economies of scale, GVCs disproportionately favor large firms. They increase product market concentration to highly productive “superstar” firms.⁸ Superstars can raise their markups disproportionately instead of passing on their cost savings created by GVCs to workers and consumers (Autor et al., 2020; DeLoecker et al., 2020). Since capital ownership tends to be concentrated to a relatively few, the increased share of capital in income widens income inequality. This effect can be further amplified through reduced tax payments by MNEs as they have wider possibilities to exploit tax planning and transfer pricing schemes (World Bank, 2020).

⁸ Superstar firms, which are often the largest and most productive corporations in a given market, typically have gained market share rapidly, e.g. Amazon in the US (Autor et al. 2020).

Looking closer at trends in the income share of labor, we see that the share of low-skilled labor has declined, while the share of high-skilled labor has increased – especially in advanced economies. While the main factor affecting this development again appears to be automation, GVC expansion has played a role. Even if GVC participation tends to support aggregate employment, it can lead to substantial shifts in the sectoral and occupational structure of employment (Bacchetta & Stolzenburg, 2019; IMF, 2017; Reijnders & de Vries, 2018; Timmer et al., 2014).

Evolution of complex GVCs has increased imports and offshoring of labor intensive manufacturing to emerging economies. This has contributed to the diminishing share of manufacturing in the production and employment of advanced economies. Support tasks in service sectors requiring mainly middle-skilled labor have also been increasingly offshored in recent decades as part of GVC expansions. This has reduced demand for low- and middle-skilled labor in advanced economies and contributed to job market polarization in certain countries. The new jobs created by increased GVC participation have emerged in different sectors and require different qualifications. As it takes time and effort for governments and businesses to match redundant workers with new jobs, low- and medium-skilled workers, at least in the short-term, can be hurt by increased GVC participation in the absence of appropriate redistributive policies (Autor et al., 2016; ECB, 2019; OECD & Statistics Finland, 2020; Pierce & Schott, 2016; Rodrik, 2018; Timmer et al., 2015).

For emerging economies, it also appears that (relatively) skilled labor has gained more from GVC participation than unskilled labor. This reflects the higher complexity and quality requirements associated with GVC trade compared to conventional trade (Antras, 2019; De Vries et al., 2019; Hollweg, 2019). The lack of sufficiently skilled labor could inhibit the entry of many emerging economies into even specific narrow GVC production stages (Rodrik, 2018). While GVC participation has supported a shift to higher value-added production for certain emerging economies, this is not the case universally. Indeed, heavy specialization in low value-added production stages could even hamper the development of more sophisticated production in emerging economies (Antras, 2019; Ignatenko et al., 2019; World Bank, 2020).

3. Long-term trends affecting GVCs and the impact of the Covid-19 pandemic

The Covid-19 pandemic, which has already affected GVCs through several channels, is obviously the most topical factor brought up in the current GVC discussion. There are several long-term trends that have already impacted GVCs in recent years and are set to shape them further in the future. The current pandemic bolsters some of these trends, but overall the effects on GVC development are ambiguous.

3.1 Long-term trends

Key trends that are expected to affect the future development of GVCs include the rise of protectionism, technological development, environmental issues and trends in emerging economies, particularly China. These trends are familiar, but their impacts on GVCs could be amplified by the pandemic in coming decades (Antras, 2020; OECD, 2017; UNCTAD, 2020).

3.1.1 Protectionism

Despite substantial liberalization of global trade and financial markets, there are still plenty of barriers to trade and investment, especially for services trade, non-tariff barriers and localization requirements (ECB, 2019; OECD, 2017). Moreover, protectionist pressures and opposition to free trade have been on the rise for years, as well illustrated by the recent US-China trade war and Brexit vote.⁹ While protectionist policies have traditionally been justified as supporting domestic production and employment, national security grounds (e.g. securing supplies of essential goods or access to critical technologies) are increasingly mentioned in policy discussions (OECD, 2017; UNCTAD, 2020).

Protectionist policies hamper any trade, but they are particularly damaging to GVC trade. Restrictions on foreign investment discourage expansion of GVCs. Tariff and non-tariff barriers increase trade costs. This effect is magnified for GVCs as goods typically cross borders several times during the production process. In addition, import tariffs are typically levied on the gross value of imports instead of value added embodied in imports. If foreign value added accounts for a large part of the total value added, even a small tariff can increase costs substantially. The effects of tariff protection also change in the context of GVCs. Import tariffs on intermediates can increase the production costs of domestic companies, whereas import tariffs on foreign final goods can hit also domestic producers of intermediate goods. The literature suggests that the magnification effect of trade barriers for GVC trade can be substantial, thereby eroding competitiveness and causing significant welfare losses (Antras & de Gortari, 2020; Blanchard et al., 2016; Cappariello et al., 2020; Diakantoni et al., 2017; OECD, 2013; World Bank, 2017).

3.1.2 Technological development

Technological development, which has historically shaped the development of GVCs, will doubtless continue to do so in the future. Technological advances can have mixed impacts on GVCs, however. This is well illustrated by two important current technology trends: digitalization and automation.

Digital technologies help reduce coordination and transaction costs, enable effective coordination of complex value chains and facilitate wider access to GVCs. This supports more extensive dispersion of production, making it possible to provide a wider selection of services from a distance. Digitalization also supports access of smaller, more peripheral participants to GVCs by lowering the fixed costs associated with GVC participation and alleviating the effect of structural impediments like poor infrastructure or weak institutions. Digitalization can increase servicification of production and the share of value added accruing to the first and last stages of production. It can support consolidation in global markets by strengthening the role of large MNEs providing digital infrastructure (Antras, 2019; Baldwin & Forslid, 2020; Ferrantino & Koten, 2019; Fort, 2017; UNCTAD, 2020).

On the other hand, increasing automation diminishes the significance of labor costs in production. Moreover, advanced industrial robots allow performing a sequence of tasks effectively in one location. These effects undermine a key driver of GVC expansion and reduce the incentives to dispersion of production. On the other hand, there is evidence that higher production allowed by automation leads to higher demand for inputs and can thus also support GVC trade (Antras, 2020; Freund et al., 2019). Increased automation requires capital investment, making production more capital intensive and increases economies of scale. In addition, the share of value added captured in the manufacturing stages of the production chain increases (OECD, 2017; UNCTAD, 2020).

⁹ There are also countervailing tendencies as illustrated e.g. by the recent free-trade agreement between the EU and Vietnam and the freshly signed Regional Comprehensive Economic Partnership (RCEP) between countries in the Asia-Pacific region.

3.1.3 Climate change and environmental issues

Climate change and other environmental issues are likely to affect GVC development (Antras, 2019; OECD, 2017). The economic effects of climate change arise from physical risks and transition risks. *Physical risks* refer to natural phenomena associated with climate change. These include short-term extreme weather events (e.g. hurricanes) and gradual long-term effects with the global warming as the most important example. *Transition risks* refer to changes (e.g. policies) associated with the shift to a low-carbon economy that is required to mitigate the climate change. (Batten, 2018).

Starting from physical risks, climate change is found to be associated with an increase in severity and frequency of extreme weather events. Extreme weather events can cause substantial disruptions on GVCs e.g. by destroying production facilities. Reducing risks related to disruptions caused by extreme weather events can require diversification and increased redundancy in GVCs. The key longer term physical risk related to climate change is gradual warming. Gradual warming can affect economies through several channels, especially productivity of labor and agriculture. Increases in average temperature are associated with adverse economic effects and the literature suggests that economies with hot climates are particularly vulnerable. Thus, climate change could affect the geographical distribution of GVCs (Batten, 2018; Simola, 2020).

Transition risks are relevant for GVCs, especially through policies aimed at reducing carbon use. They can increase the price of carbon or ban emission-intensive production altogether. This is likely to heighten transport costs supporting shorter and more clustered GVCs, which often also make it easier to monitor and trace the emissions throughout the entire supply chain. In addition, it might restrict the attractiveness of developing markets as a location for GVCs as they tend to be more emission intensive. On the other hand, technology transfer through GVCs could result in cleaner production in developing markets (Antras, 2019). Policy and regulatory effects can be strengthened through better climate-risk acknowledgement in financial markets and gradually shifting consumer preferences to sustainable alternatives.

3.1.4 China and other emerging economies

The role of emerging economies in global economy has increased substantially in recent decades, led, of course, by the spectacular growth performance of China. China, one of the largest economies and exporters in the world, has seen income levels increase and wage differences with the developed world narrow substantially. Chinese supply and demand structures have shifted towards more sophisticated goods and services. At the same time, the share of foreign value added in production has declined due to advances in domestic production supported by policy measures (Kee & Tang, 2016; Pula & Santabarbara, 2011; Simola, 2018).

Increasing labor costs discourage offshoring of labor-intensive production to China (even if partly offset by improving productivity). In line with the “flying geese” metaphor, some production has already shifted to lower-cost countries such as Vietnam or Cambodia. While there are still numerous countries with abundant labor and low wages, incentives to offshore labor-intensive production may evaporate as the share of labor in production costs has declined in many sectors. In addition, GVC production tends to require relatively skilled labor making GVC entry off the table for some countries (Antras, 2019; OECD, 2017; Rodrik, 2018).

Several factors still pull production to China. High economic growth, increased purchasing power and massive markets attract manufacturers seeking to be close to customers. As Chinese production has extended to tasks and sectors with higher value added, there is less need for imported

inputs. Additionally, the role of services in the Chinese economy has increased. Service sectors typically use less imported inputs than manufacturing.

In value terms, it is worth noting that most GVC trade is conducted between high-income countries. China's rising income levels could imply higher involvement of China in GVCs. There is also evidence that the relationship between GDP per capita and backward participation in GVCs is U-shaped. Several of the large Chinese MNEs (e.g. Huawei and Alibaba) that emerged in recent years are now expanding rapidly into international markets (Baldwin, 2012; OECD, 2017; Simola, 2018).

3.2 Covid-19 and GVCs

The Covid-19 pandemic has affected GVCs through several channels (Baldwin & Tomiura, 2020, Miroudot, 2020). Production has been directly cut by lockdown measures to restrain the pandemic, while indirect supply chain effects have arisen from a lack of foreign inputs due to disruptions in foreign production and transport networks. Demand for most products has fallen sharply as a result of the economic crisis caused by the pandemic. On the other hand, global demand for certain medical products has increased substantially, even resulting in temporary shortages and export restrictions. Shocks hitting one link in the value chain are transmitted and amplified through GVCs to several locations (Bonadio et al., 2020; Di Nino & Veltri, 2020; Sforza & Steininger, 2020; Simola, 2019; Simola & Solanko, 2020).

The coronavirus blow to GVCs led many observers to fear that the pandemic could result in a massive restructuring of value chains. Such effects are not necessarily straightforward or given, however. First, it seems that the pandemic has not hit GVC trade especially hard (at least not yet). Second, experiences from previous crises suggest the feared massive restructuring will likely be avoided. Third, the optimal longer-term strategies for preparing for a crisis might vary across industries and companies not necessarily involving value chain restructuring. The Covid-19 crisis has fortified some of the trends noted above, but the effects are ambiguous.

3.2.1 Trade trends during the Covid-19 crisis

Global trade collapsed this spring due to the economic crisis and other problems caused by the pandemic. The WTO estimates that the volume of global merchandise exports declined 18% y/y in 2Q20, i.e. at the same pace as in 2Q09. Taking into account the steep contraction in GDP of several countries, goods trade has so far fallen more moderately in relative terms than during the 2008 GFC.¹⁰ OECD data for G20 countries shows that in the trough of the 2008 GFC in 1Q09–2Q09, the combined GDP of the G20 countries contracted by 5% y/y, while trade declined by 15% y/y. In 2Q20, the corresponding figures were 12% and 20%. This reflects the fact that pandemic hit the service sector particularly hard, but so far at least it seems that contagion effects to manufacturing, international trade and GVCs have not been as great as feared.

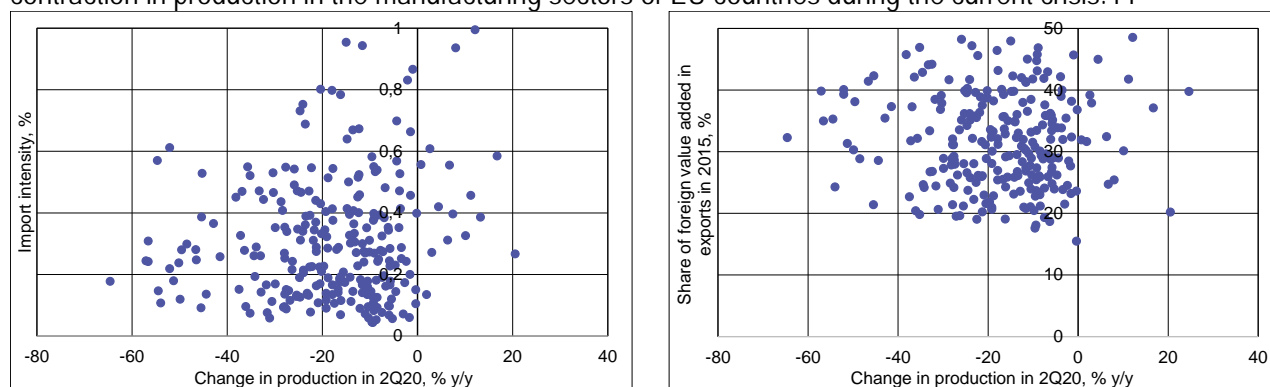
As the input-output data covering recent developments will not be published until much later, we utilize production data and ordinary trade statistics to form a preliminary picture on the role and development of GVCs during the current crisis. We focus on the EU due to the convenient availability of suitable trade data, but also provide comparison data from other major GVC hubs, specifically the US, Japan and China. We examine the development of trade in various product categories during the current crisis and compare it to the GFC of 2008.

¹⁰ The decline would apparently have been even more modest if fuel trade was excluded. Global oil demand dropped much more sharply this spring than in 2009.

For our first piece of the picture, we broaden the example of Miroudot (2020a, b) and check whether production contracted more in the EU in sectors where production tends to be fragmented. We use import intensity and share of foreign value added in exports as proxies for GVC participation. Even if we know most service sectors have been hit hard by the Covid-19 crisis, we focus on manufacturing because manufacturing sectors are usually more involved in GVCs.

A simple comparison across EU countries and manufacturing sectors suggests that there is practically no correlation between the fragmentation of production and severity of fall in production during the deepest crisis period in 2Q20 (Fig. 3). The picture is quite similar for both intra-EU and extra-EU value added in exports, implying that the crisis has not even hit global (as opposed to regional) production chains particularly hard. Meier & Pinto (2020) examine the issue more formally for the US industrial production and find no consistent evidence of a negative relationship between import intensity and output except for imports from China. The effect concerning Chinese imports is also found to be short-lived, however.

Figure 3. a) Import intensity of production. b) Share of foreign value added in exports compared to the contraction in production in the manufacturing sectors of EU countries during the current crisis.¹¹



Sources: Eurostat, OECD TiVA.

Next, we move on to detailed analysis of EU trade flows.¹² Following Gaulier et al. (2020), we utilize the Broad Economic Categories (BEC) classification often utilized in constructing international input-output tables.¹³ Our analysis complements the results of Kejzar & Velic (2020) suggesting that GVC linkages are important for the EU countries primarily in the propagation of demand shocks.

We use plain value data without any adjustment for price effects. Fuels are excluded from the analysis as they are highly sensitive to price changes and not central to our analysis. The categories most relevant for GVCs are industrial supplies and parts and accessories. Parts and accessories (P&A) in particular can serve as a proxy for complex GVC trade. The correlation between the share of these intermediates in goods imports and the backward participation index for manufacturing sector is comparatively high 0.6.¹⁴ As a result, our analysis focuses on imports as a proxy for overall GVC development.¹⁵

¹¹ The data cover 21 EU countries and 14 manufacturing sectors for which data are available. For Figure 3a, the correlation is 0.13. For Figure 3b the correlation is -0.07.

¹² The EU refers to EU27 (i.e. without UK) throughout this section. Eurostat provides time-series data for this aggregate.

¹³ See Appendix for more detailed information of the classification.

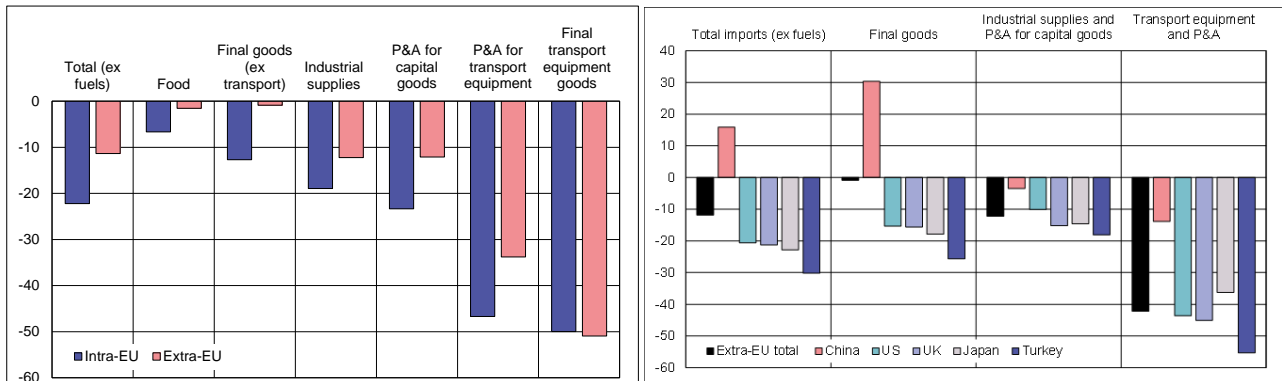
¹⁴ The correlation is calculated for the share of industrial supplies, parts and accessories in the total goods imports and the share of foreign manufacturing sector value added in the manufacturing sector exports for 24 EU countries in 2005–2015 (annual data).

¹⁵ The results are similar for EU export data.

The EU trade data show that import development has varied considerably across product categories (Fig. 4a). The variation is similar in intra-EU and extra-EU trade, although the contraction tends to be smaller for extra-EU trade. Imports of food and final goods show the smallest declines. Imports of most intermediates (industrial supplies and parts & accessories for capital goods) have contracted roughly at the same pace as total imports excluding fuels. The largest drop by far is recorded for transport equipment as well as their parts & accessories.

In most product categories, intra-EU imports have fallen more sharply than extra-EU imports. Drilling down into the extra-EU imports data, we find that the development is similar across main trading partners except for the strikingly different performance of China, the largest external import market of the EU (Figure 4b). While the value of imports (excluding fuels) fell 20–30% y/y from other large markets, the value of imports from China actually grew 16% y/y in 2Q20. The growth was based on final consumer and capital goods, apparently reflecting trade in Covid-19-related goods (Kerola, 2020). In other product categories, especially transport equipment and their parts and accessories, imports from China declined, but more mildly than from other main external markets.

Figure 4. a) Change in the value of intra-EU and extra-EU imports by product category in 2Q20, %, y/y. b) Change in the value of extra-EU imports by product category and country in 2Q20, % y/y.

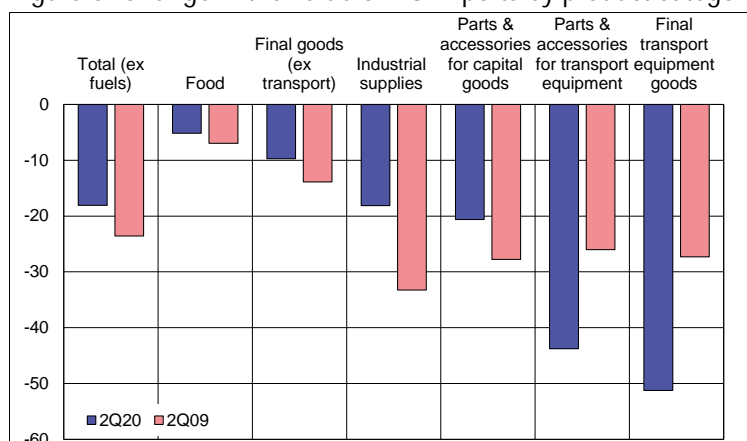


Source: Eurostat.

We now compare the import development in the current crisis with the 2008 GFC.¹⁶ During the current crisis, total EU imports have contracted slightly less than in 2009 (Fig. 5). Development is similar across most product categories. The main difference compared to the previous crisis is the trend for imports of transport equipment and their parts and accessories. These imports have fallen much more than in 2009.

¹⁶ We present here the results comparing 2Q09 and 2Q20, but the results are similar for all of 2009.

Figure 5. Change in the value of EU imports by product categories in 2Q09 and 2Q20, % y/y.



Source: Eurostat.

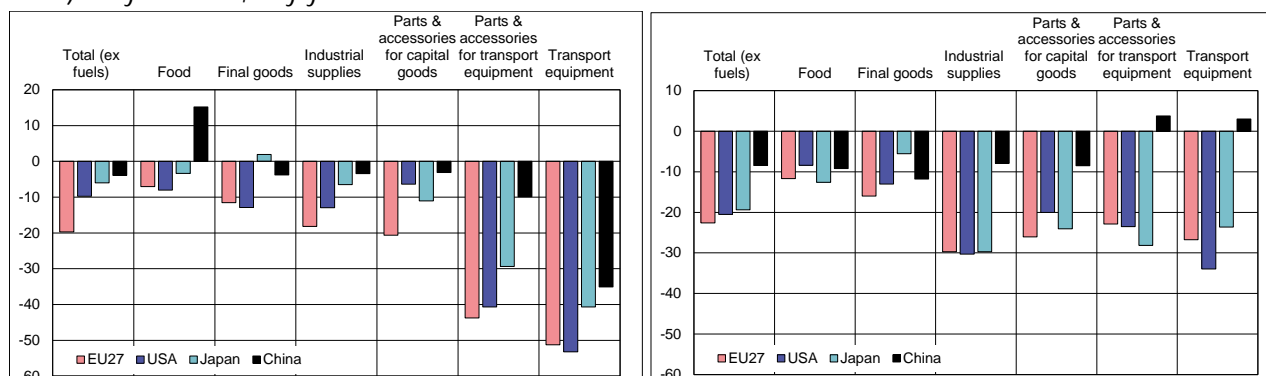
Finally we compare the EU import development to other important GVC hubs, i.e. the US, Japan and China.¹⁷ The comparison shows that the main trends in EU imports are visible also in the imports of the US and Japan, while the case of China has some differences (Fig. 6). For the US and Japan, imports of final goods tend to have declined less than the imports of intermediate products. For China, there are no major differences across final goods and intermediates (with the exception of food imports, which have grown substantially).¹⁸ In all other countries, the imports of transport equipment and their parts & accessories have contracted much more sharply compared to other major product categories. In comparison to the international final crisis, the total imports of other countries have declined more mildly than the EU imports. For the US, this reflects mainly the development in intermediate imports, while for Japan and China it mainly concerns final goods. As with the EU, the import development in the other countries seems to differ from the 2008 GFC, particularly with the much sharper contraction in the imports of transport equipment and their parts and accessories compared to other product categories.¹⁹

¹⁷ For the US and Japan, we use data for 2Q20. For China, we focus on 1Q20 (China took its biggest hit from the crisis in 1Q20). Chinese imports declined at about the same pace in 1Q20 and 2Q20 (excluding fuels) and the results are quite similar for 2Q20, although some recovery is already evident.

¹⁸ This finding is supported by Chinese import statistics on ordinary and processing trade.

¹⁹ This difference might be overestimated, however, as we compare the data for 2Q20 and FY2009. In any case, the differences for the EU27 are small. In addition, the US development partly reflects the US-China trade war.

Figure 6. Change in the value of imports of the EU27, the US, Japan and China in a) 2Q20 (1Q20 for China) and b) full year 2009, % y/y.



Sources: Eurostat, US Census Bureau, UN Comtrade.

Our examination of the latest 2020 trade data suggests that GVC trade has been hit hard by the Covid-19 crisis, but has not collapsed. Our indicative results point to GVC trade declining slightly more in the current crisis than conventional trade as trade in industrial supplies and parts and accessories has contracted more strongly than trade in food and final goods. On the other hand, GVC trade seems to have declined less than during the 2008 GFC. A notable exception in comparison to 2009 is the sharp fall in the trade of transport equipment, both final goods and parts and accessories.

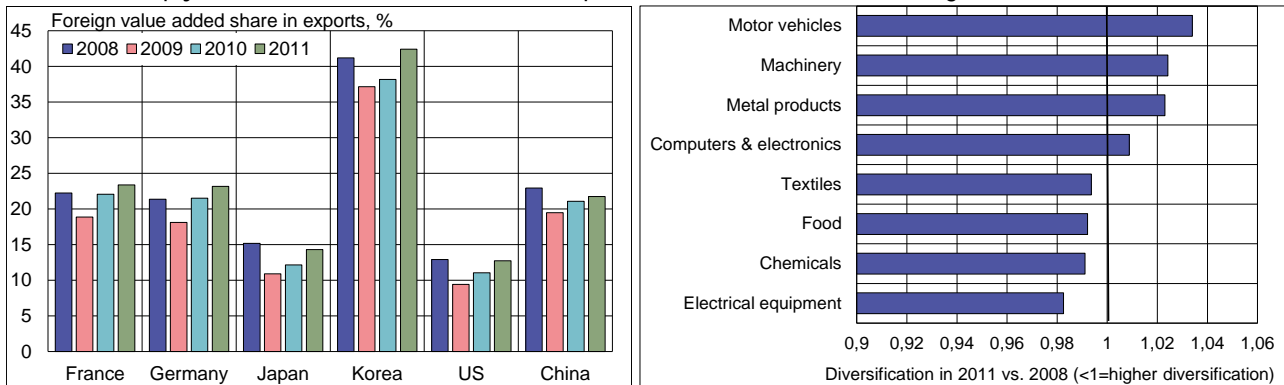
3.2.2 Comparison to previous crises

Some of the unique features of the current crisis defy historical comparison, but previous crises nevertheless may help shed light on the potential consequences for GVCs this time around. The obvious reference points are the 2008 GFC and the massive natural disasters in East Asia in 2011. The first crisis was global in nature and closest in magnitude of global economic consequences as the current Covid-19 crisis. The latter crisis specifically concerns supply chain disruptions.

As noted above, GVC trade collapsed during the 2008 GFC, but recovered quite rapidly to pre-crisis levels. The trade collapse was mainly due to a substantial reduction in demand. Although the current crisis is also associated with supply shocks, it now seems that the main blow has again come from the sharp drop in demand. Supply chain problems have affected production in several countries and sectors, but most GVCs appear to have been quite resilient.

Based on the experiences from the 2008 GFC, the current crisis might not lead to a major restructuring of GVCs (Antras, 2020; Miroudot, 2020a, b). For example, measured by backward participation, the recovery of GVC trade from the 2008 GFC was relatively rapid (Fig. 7a). Backward participation reached the pre-crisis level in most countries by 2010 or 2011. In addition, at least on the aggregate level, there is no indication of a clear trend towards more geographical diversification or concentration across value chains in different industries (Fig. 7b).

Figure 7. a) Backward participation for select countries in 2008–2011. b) The average ratio of Herfindahl-Hirschmann index for the geographical distribution of value added in select industries in 2011 compared to 2008 (values >1 imply lower diversification in 2011 compared to 2008 and values <1 higher diversification).²⁰

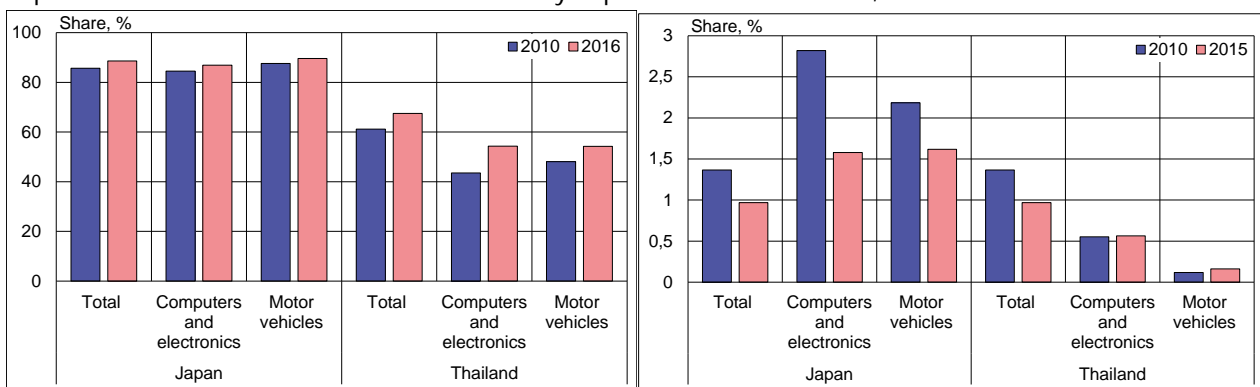


Source: Author's calculations based on OECD TiVA data.

From the perspective of supply shocks, the most commonly mentioned reference points are the massive earthquake in Japan and flood in Thailand in 2011. These two events caused serious supply disruptions for GVCs, particularly in the car and computer industries. It seems that these catastrophes resulted in some diversification of suppliers and may have contributed to the slowdown in GVC expansion. They did not, however, lead to any major reshoring, and quite the opposite in some cases (ECB, 2019; Miroudot, 2020a, b).

At the aggregate level, the domestic value added in the exports of Japan and Thailand was slightly higher in 2016 compared to 2010, both in total exports and in exports of computers and motor vehicles (Fig. 8). This suggests that there was no major diversification in domestic value chains. On the other hand, the share of Japanese and Thai value added in the exports of other countries was slightly lower in 2015 compared to 2010. A similar trend prevails for Japan at the sector level for computers and electronics, but the share of Thai value added in other country exports in these sectors actually increased slightly after the natural disaster. These indicative results from the aggregate level analysis are supported by anecdotal evidence and more comprehensive studies (Miroudot, 2020a,b; Todo et al., 2014; Zhu et al., 2017).

Figure 8. a) Share of domestic value added in exports of Japan and Thailand in 2010 and 2016, %. b) Share of Japanese and Thai value added in other country exports in 2010 and 2015, %.



Source: OECD TiVA.

²⁰ Simple average of the Herfindahl-Hirschmann index calculated for the geographical distribution of value added for each industry across 60 countries in the OECD TiVA database (Brunei, Cyprus, Luxemburg and Malta were excluded).

3.2.3 Longer-term effects of Covid-19 on GVCs

Over the longer term, the Covid-19 crisis can affect the development of GVCs through changing corporate strategies in designing GVCs and by fortifying the effects of other trends discussed above. The most-mentioned anticipated features of GVC restructuring from the Covid-19 crisis include the reshoring GVC production to home countries, shortening GVCs, as well as diversification of input suppliers (Javorcik, 2020). While possible for some GVCs, the implications are generally not so straight-forward, however. For example, the results of Bonadio et al. (2020) suggest that, without GVCs at their current scale, the negative effects of the current crisis on production and employment could have been more severe for some countries. OECD (2020) simulations also show that a more localized regime of world production is more vulnerable to shocks than the type of GVC network currently in place.

Miroudot (2020a,b) notes that the risk management literature typically finds supporting various adjustment capabilities more appropriate than value chain restructuring. Firms face multitude of risks and may value different features that also require partly different management strategies. For example, *resilience* refers to the ability to restore operations after a disruption, while *robustness* is the ability to continue operations even during a disruption. For companies producing essential goods, robustness tends to be more important in safeguarding continuous production of e.g. food and medical supplies. Building robustness typically implies diversification of suppliers. For companies that are willing to accept the risk of a short-term cessation of operations, however, it can be less costly and enable faster recovery to have a long-term relationship with a single or few suppliers. McKinsey (2020) points that the risks faced by various sectors and companies may differ substantially, thereby requiring differing risk management strategies.

The pandemic can also strengthen the effects of other trends affecting the development of GVCs. Protectionist pressures increased further, especially in the spring during the most intensive period of the pandemic. Several countries introduced export bans on essential products to ensure their domestic availability. Temporary deficits experienced on certain medical products led to increased demands on reducing dependency on imports. Although there is evidence that trade restrictions are not the optimal policy for solving such issues, the discussion is likely to continue (Baldwin & Evenett, 2020; Miroudot 2020c).

Covid-19 experiences can also increase incentives for further automation to reduce risks related to human employees and thus possibly support reshoring (Bloom & Prettner, 2020; Seric & Winkler, 2020). On the other hand, the pandemic has taught companies across the globe to utilize digitalization and teleworking possibilities more efficiently. This creates new possibilities for offshoring (Autor & Reynolds, 2020; Sostero et al., 2020). Certain examples such as the rapid ramping up of Covid-19 test kit production in Korea and the deficit of facial masks further illustrate the importance of GVCs during the current crisis (Miroudot, 2020a; OECD 2020b).

4. Future development of GVCs

As the above discussion shows, there are several factors that can affect GVC development and their impacts are often ambiguous. The ongoing Covid-19 pandemic can affect risk management and design of GVCs and reinforce impacts of other key factors. It is unclear which factors and which effects will dominate in shaping GVCs over the coming years.

The trends discussed above do not necessarily imply substantial changes in existing GVCs, but rather affect the design of future GVCs. Profound transformation of a complex GVC could be difficult and costly as GVC structures involve many relatively fixed relationships and linkages. Trying to force

the linkages break up e.g. through protectionist policies could lead to serious problems for GVCs. For example, McKinsey (2020) estimates that the US and Chinese computer and electronics companies Dell and Lenovo each have 4,000–5,000 suppliers, of which over 2,000 are common to both companies. Many GVCs are associated with MNEs that have made substantial investments in building the chain which can be thought of as sunk costs. Therefore it could be very costly to substantially reorganize existing GVCs. While reshoring may increase to some extent, the volumes could be limited as seen also in previous years (Antras, 2020; De Backer et al., 2016; Fillat & Garetto, 2015; Miroudot 2020b; Qiang et al., 2020).

Nevertheless, the main drivers of rapidly expanding global dispersion of production seem to have faded substantially. Regarding the overall development between concentration and dispersion, factors discouraging further dispersion of production seem to dominate. They might get further boost from the Covid-19.

Automation, protectionism, efforts to mitigate climate change and the development of Chinese economy largely pull production within boundaries of individual countries or at least within a small geographical distance. The current pandemic could lead to GVC risk management strategies based on production chains with less production stages and more concentrated location. In addition, the pandemic can lead companies to push for more automation of production, increase calls for protectionist measures on the grounds of supply security and reduce international travel all actions that diminish incentives for cross-border dispersion of production. The ultimate effects can, however, be ambiguous. Wider automation could also increase imports of inputs, while protectionism, at least in certain cases, could promote regional value chains even if it otherwise tends to hurt global production networks. An important trend supporting further expansion of GVCs is digitalization. Covid-19 has uncovered large possibilities for digitalization and teleworking previously underutilized.

In geographical terms, the trends seem to favor mainly large and relatively advanced economies. Protectionism and quest for self-sufficiency tend to be less costly and easier to realize in large countries with abundant consumer markets and large supplier bases. Acquiring new technologies is expensive and thus limited to economies with capital abundance. In addition, utilizing advanced technologies may require relatively high-skilled labor that is not always readily available in developing countries. Risks related to climate change are particularly high for many emerging and developing economies. They are often located in areas most vulnerable to extreme weather events and gradual global warming is expected to have strongest adverse economic effects on countries with hot climates. Production of emerging economies tends to be more emission intensive, which may become a disadvantage for GVC location.

The importance of various factors is likely to be different across sectors. Protectionist pressures and aims for self-sufficiency in production are most relevant for sectors supplying essential goods, sectors related to strategically important technologies and sectors that provide employment on a large scale. Automation improves productivity in certain labor-intensive tasks, but can be less suitable and profitable to utilize in sectors such as textile manufacturing. Digitalization can support the global dispersion of service tasks in particular. Risks related to climate change are especially relevant for primary sectors, emission-intensive production and sectors sensitive to increases in transport costs. China's rising income levels are especially attractive to consumer-driven sectors that want to locate close to customers (McKinsey, 2020; UNCTAD, 2020; WEF, 2019).

In general, it appears that the most intense phase of GVC expansion has already passed. Nothing similar is likely in the near future. But global dispersion of production will most likely remain close to current levels, even as some reshoring takes place and new regional value chains are created. Most GVCs will probably be concentrated in a few large and centrally located hub economies, while smaller, poorer and peripheral countries risk being set adrift.

From an economic standpoint, a policy induced further stagnation of GVC expansion could imply further slowing in global productivity gains and economic growth. Such slowing weakens the outlook for employment and wage growth even in advanced economies. Reshoring of production to advanced economies can increase technological investment in the domestic economy, but hardly brings back the previously lost manufacturing jobs as any reshored production tends to rely increasingly on automation. Thus reshoring can generate less overall employment. Job creation, if any, focuses on skill-intensive work (Bloom & Prettner, 2020; De Backer et al., 2016; Krenz et al., 2018; OECD, 2017).

Finally, it appears that the role of manufacturing as an engine of development has generally declined. Of course, the share of manufacturing in value added of GVCs and employment has been diminishing for decades. With stalling GVC development, however, developing countries will find it increasingly difficult to enter global markets and get a jump-start on their economic development. This is particularly alarming since many poor countries have already been hit hard by the pandemic and are also the most vulnerable to risks related to climate change (Rodrik, 2016; WEF, 2019).

5. Summary

Global value chains (GVCs) have shaped the global economy and trade substantially in recent decades. Like conventional trade, the main motivation of GVCs are productivity gains from specialization in certain production roles. In GVCs, this specialization tends to be far deeper and relationships between participants tend to be complex and long-lasting. Supported by technological advances, liberalization policies and the opening up of communist countries (particularly China), the heyday of GVC expansion occurred in the 1990s and early 2000s. GVCs were then hard hit by the 2008 Global Financial Crisis (GFC). Despite their rapid recovery, the expansion of GVCs has stalled in recent years with the evaporation of many of the previous key drivers.

While increased GVC expansion is common to most countries, there is much variation in GVC participation across regions, countries and sectors. The main GVC regions are Europe, East Asia and North America. These GVCs have been built around the firms in the hub countries of Germany, Japan, China and the US. Other regions are less integrated in GVCs. European value chains are mainly regional. Regionalization has also increased in East Asian value chains, but for other regions the value chains tend to be global. This largely reflects the spectacular rise of China in GVCs in recent decades.

GVC expansion has improved firm productivity and supported economic growth globally. Many developing countries have received a boost for growth from participating in GVCs that has created millions of jobs and lifted people from poverty. However, the gains from GVC expansion have not been distributed equally across countries, firms and individuals. Without appropriate redistributive policies, GVC expansion can leave some members of society worse off at least in the short-term. Although it is often difficult to disentangle the effects of increased automation in production and GVC expansion, it seems that capital and skilled labor have benefited disproportionately from the productivity gains provided by the wider dispersion of production. It has also contributed to greater income inequality in some countries. Appropriate policy measures are needed to mitigate these adverse effects.

The key trends that will shape GVCs in the future include technology, protectionism, environmental issues and the development of emerging economies. The impact of technology on GVC expansion will be mixed. Automation tends to reduce incentives for dispersion of production, while digitalization facilitates wider participation in GVCs. If protectionist pressures intensify further in the future, it could lead to a certain amount of reshoring of production and GVC dismantling.

Increasing environmental awareness, especially with regard to climate change risks, could also push for shorter and more local value chains. While the development of emerging economies reduces possibilities for cost savings, it can support GVC expansion based on other motives such as economies of scale or proximity to final consumers.

The Covid-19 crisis may not result in major GVC restructurings, but it can amplify other GVC trends. While the pandemic has led to disruptions in GVCs, our preliminary analysis suggests that GVCs have not been hit particularly hard. The current crisis seems to have again been to a large extent demand-led as in the 2008 GFC. During the 2008 GFC, GVC trade initially declined substantially but then recovered rapidly. No major structural changes in GVCs resulted. Major supply shocks from the huge natural disasters in Japan and Thailand in 2011 led to some diversification of production chains, especially in the motor vehicle production, but again, no major GVC restructurings. This partly reflects the fact that optimal strategies for improving risk management can vary substantially across sectors and companies. The Covid-19 crisis has reinforced many other trends affecting GVC development, however. For example, automation and digitalization have accelerated and protectionist pressures have increased.

Several trends constrain GVC expansion in the years ahead, implying GVC development will continue to stall, but complexity and high restructuring costs related to GVCs will likely prevent any wide-scale dissolution of existing GVCs.

Policy measures that hamper GVC development could weigh on global productivity and economic growth in the coming years. Even reshoring of GVC production is unlikely to bring back jobs that were previously shifted abroad. The lack of GVC growth makes it harder for emerging economies to access global markets, and thereby constricts their growth opportunities. This further darkens the economic perspectives of many poor countries that have already been hit hard by the Covid-19 pandemic, the very countries also most vulnerable to risks related to climate change.

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Appendix

Classification by Broad Economic Categories (BEC) at the 2-digit level

1	Food and beverages
11	Food and beverages; primary
12	Food and beverages; processed
2	Industrial supplies not elsewhere specified
21	Industrial supplies not elsewhere specified; primary
22	Industrial supplies not elsewhere specified; processed
3	Fuels and lubricants
31	Fuels and lubricants; primary
32	Fuels and lubricants; processed
4	Capital goods (except transport equipment), and parts and accessories thereof
41	Capital goods (except transport equipment)
42	Capital goods (except transport equipment); parts and accessories
5	Transport equipment and parts and accessories thereof
51	Passenger motor vehicles
52	Transport equipment, other than passenger motor vehicles
53	Transport equipment; parts and accessories
6	Consumer goods not elsewhere specified
61	Consumer goods not elsewhere specified; durable
62	Consumer goods not elsewhere specified; semi-durable
63	Consumer goods not elsewhere specified; non-durable
7	Goods not elsewhere specified

Source: Finnish Customs.

The aggregates used in Section 3.2.1 include the following product categories:

Total (except fuels) = Sum of all categories except 31 and 32

Food = 11, 12

Final goods = 42, 61, 62, 63

Industrial supplies = 21, 22

Parts & accessories for capital goods = 42

Parts & accessories for transport equipment = 53

Transport equipment = 51, 52.

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